2) Enhanced - For a single initial vacancy in subshell i, this includes all photons emitted due to transitions filling either the initial vacancy or filling any other vacancies within the *same shell* that have been created due to the initial vacancy. The enhanced yield corresponds to Krauses's[19] definition of the effective yield, υ_i .

These other vacancies can be created by radiative or nonradiative (Coster-Kronig) transitions between subshells of the same shell. Compared to the direct yield, these additional photons emitted from the same shell will enhance the observed photon yield. Since the binding energy of different subshells in the same shell are very similar, it is experimentally difficult to distinguish between the direct and the enhanced photon yields.

3) Total - For a single vacancy in subshell i, this includes all photons emitted due to transitions filling either the initial subshell vacancy or filling any other vacancies within *any subshell* that have been created due to the initial vacancy.

Compared to the enhanced yield, the total yield may include additional photons but generally, these will be of lower energy that is more readily distinguished from the direct and enhanced yields in experimental observations.

From the above definitions, one has: total $\geq$ enhanced $\geq$ direct .

Accuracy of Data

By comparing subshell parameters from a number of different sources, it can be seen that there is still a disagreement of about 1% between the binding energies. For use in applications, particularly coupled electron-photon transport, knowing the exact binding energies is not as important as ensuring that the same binding energies are used throughout. Therefore, Scofield's subshell parameters[6] are consistently used for both atomic, photon, and electron data.

Based on the calculations of Chen, [10-16] the Auger (nonradiative) widths for an inner shell vacancy are known to better than 15% if the inner shells do not decay by Coster-Kronig or super Coster-Kronig transitions; for these transitions, the widths can be too large by a factor of 2. These uncertainties directly affect the competition between radiative and nonradiative yields (e.g., the fluorescence yield).

The K and L shell radiative rates from Scofield's [6-9] calculations are accurate to about 10%. For outer subshells with transitions under 100 eV, inaccuracies of 30% would not be surprising.

Associated Libraries and Availability of the EADL

EADL only contains the data necessary to describe the relaxation of ionized atoms. In order to perform coupled photon-electron calculations, in particular to describe events that lead to ionization, two additional libraries are available.

1) The Livermore Evaluated Photon Data Library (EPDL)[2], to describe the interaction of photons with matter.

2) The Livermore Evaluated Electron Data Library (EEDL)[4], to describe the interaction of electrons with matter.

All three of these libraries are available in the ENDL format.[1] It should also be noted that the results presented here describe EADL as of July, 1991. Because of recent reevaluation, the present results regarding x-ray (fluorescence) emission, electron emission, and energy deposition supercede the results reported in our earlier publications.[2,20] The subshells that are present in both the EADL as well as in the other two libraries are listed in Table 1.

Table 1. Subshells that contain electrons in the EADL and the elements in which the subshell first becomes occupied.

Z	Element	Subshell	Z	Element	Subshell
1	H	K (1s1/2)	58	C	N7 (4f7/2)
3	Li	L1 (2s1/2)	37	Rb	O1 (5s1/2)
5	B	L2 (2p1/2)	49	In	O2 (5p1/2)
5	B	L3 (2p3/2)	49	In	O3 (5p3/2)
11	Na	M1 (3s1/2)	57	La	O4 (5d3/2)
13	Al	M2 (3p1/2)	57	La	O5 (5d5/2)
13	Al	M3 (3p3/2)	91	Pa	O6 (5f5/2)
21	Sc	M4 (3d3/2)	91	Pa	O7 (5f7/2)
21	Sc	M5 (3d5/2)	55	Cs	P1 (6s1/2)
19	K	N1 (4s1/2)	81	Tl	P2 (6p1/2)
31	Ga	N2 (4p1/2)	81	Tl	P3 (6p3/2)
31	Ga	N3 (4p3/2)	89	Ac	P4 (6d3/2)
39	Y	N4 (4d3/2)	89	Ac	P5 (6d5/2)
39	Y	N5 (4d5/2)	87	Fr	Q1 (7s1/2)
58	Ce	N6 (4f5/2)			

Explanation of Graphs and Tables

The atomic data in this report is in the form of graphs and tables; included are fluorescence yields, subshell parameters, radiative transitions and nonradiative transitions. The atomic subshells are defined using x-ray notation. Data are presented in increasing Z (atomic number) order and for each Z in subshell order, K, L1, L2, etc.

This report is divided into four parts as follows:

Part 1 – Radiative yields. Included are the direct, enhanced, and total yields for each subshell, as defined earlier. Results are presented first graphically and then in tables. Nonradiative yields are equal to one minus the radiative yield and except for the K shell are almost all equal to unity. They are therefore not given here.

Part 2 – Subshell parameters. Units are electron volts and milli-angstroms. Included are the average number of electrons per subshell, the binding energy, kinetic energy, average radius, radiative and nonradiative widths, and the average total energy of all emitted photons and of all emitted electrons as well as local energy deposition.

Part 3 – Radiative transition probabilities and emitted photon energies. All 7667 radiative transitions are presented, first graphically and then in tabular form. Under the column heading Subshells, K L3 indicates a transition in that there is an "initial" vacancy in the K subshell and this vacancy is filled by an electron undergoing a transition from the L3 subshell, leaving a vacancy in the L3 subshell.